MULTIMEDIA **UNIVERSITY**

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FINAL EXAMINATION

TRIMESTER 3, 2016/2017

PEM0026 – TRIGONOMETRY AND GEOMETRY
(All Sections/Groups)

1 JUNE 2017
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **6** pages including the cover page.

2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of marks for each question is given.

3. Please write all your answers in the answer booklet provided. All necessary working **MUST** be shown.

4. Only **NON-PROGRAMMABLE** calculator is allowed.

APPENDIX

TRIGONOMETRY IDENTITIES

$$\sin^2\theta + \cos^2\theta = 1 \quad ; \quad \sec^2\theta = 1 + \tan^2\theta \quad ; \quad \csc^2\theta = 1 + \cot^2\theta$$

$$\sin 2\theta = 2\sin\theta\cos\theta$$

$$\cos 2\theta = \cos^2\theta - \sin^2\theta = 2\cos^2\theta - 1 = 1 - 2\sin^2\theta$$

$$\tan 2\theta = \frac{2\tan\theta}{1 - \tan^2\theta}$$

$$\sin(A \pm B) = \sin A\cos B \pm \cos A\sin B$$

$$\cos(A \pm B) = \cos A\cos B \mp \sin A\sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A\tan B}$$

$$2\sin A\cos B = \sin(A+B) + \sin(A-B)$$

$$2\cos A\cos B = \cos(A+B) + \cos(A-B)$$

$$2\sin A\sin B = \cos(A-B) - \cos(A+B)$$

$$\sin A + \sin B = 2\sin\frac{A+B}{2}\cos\frac{A-B}{2} \quad ; \quad \sin A - \sin B = 2\cos\frac{A+B}{2}\sin\frac{A-B}{2}$$

$$\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2} \quad ; \quad \cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$$

$$\sin^2\frac{A}{2} = \frac{1-\cos A}{2} \quad ; \quad \cos^2\frac{A}{2} = \frac{1+\cos A}{2} \quad ; \quad \tan^2\frac{A}{2} = \frac{1-\cos A}{1+\cos A}$$

$$\sin\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{2}} \quad ; \quad \cos\frac{A}{2} = \pm\sqrt{\frac{1+\cos A}{2}} \quad ; \quad \tan\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{1+\cos A}} = \frac{1-\cos A}{\sin A} = \frac{\sin A}{1+\cos A}$$

Continued…

QUESTION 1 (25 MARKS)

(a) Given that $\sin \theta = \frac{a-8}{a}$, $\cos \theta = \frac{12}{a}$ and θ lies in the first quadrant. Find the constant a.

[6 marks]

(b) Given that $\cos \theta = -\frac{4}{5}$ and $\tan \theta > 0$, find the remaining 5 trigonometric functions.

[5 marks]

(c) Given function $f(x) = 5\sin(4x - \pi) + 2$,

    i.   find the amplitude, period, and phase shift of the function $f(x)$.

[5 marks]

    ii.   sketch the graph of $f(x)$ in the interval of $0 \le x \le 2\pi$.

[5 marks]

(d) If $\tan \theta = 2$, show that

$$\frac{2\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 5$$

[4 marks]

Continued…

QUESTION 2 (25 MARKS)

(a) Prove the following identity

$$-4\sin^3\theta + 3\sin\theta = \sin(3\theta)$$

[6 marks]

(b) Write the expression for $\sin(\sec^{-1}u)$ as an algebraic expression in terms of u, where $u > 0$.

[4 marks]

(c) Solve the following equation on the interval $0 \leq \theta \leq 2\pi$.

$$2\sin^2\theta - 2\sin\theta\cos\theta = 1$$

[8 marks]

(d) Given that $a = \sin\theta$ and $b = \cos^2(2\theta) + \cos^2\theta$.
Express b in term of a by eliminating θ with the use of trigonometry identities.

[7 marks]

Continued...

QUESTION 3 (25 MARKS)

(a) Given an equation of $r = 6sin\theta$

     i.   Transform the equation to rectangular form. Determine whether the equation represents a circle.

[6 marks]

     ii.   Graph the equation in rectangular grid
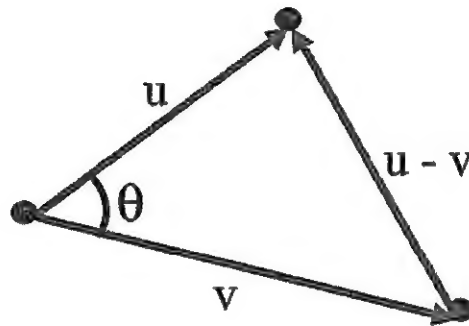
[2 marks]

(b) Find the complex cube roots of $2 + i$. Leave your answer in polar form with the argument in degrees ($0 \le \theta < 360°$).

[4 marks]

(c) Based on the following diagram, show how the law of cosines can be used to find the angle in between the two vectors u and v .

[5 marks]

(d) Given two vectors $a = -2i + 3j + 6k$ and $b = 5i - 4j + 7k$. Find their

     i.   Dot product

[4 marks]

     ii.   Cross product

[4 marks]

Continued...

QUESTION 4 (25 MARKS)

(a) Given point A (0,2). Find the equation and sketch the graph of a line passing the point A if

    i.   the slope $m = 0$

                                             [2 marks]

    ii. the slope $m = -2$

                                             [2 marks]

(b) Write the equation of the lines that parallel to the graph $2y - x = 4$ and containing the point $(-4, 4)$.

                                             [6 marks]

(c) Find the vertex, the focus , the directrix and the length of the latus rectum of the parabola $x = -\frac{1}{4}(y + 5)^2 + 3$.

                                           [12 marks]

(d) Check if the graph $x^2 + (y - 2)^2 = 4$ is symmetric with respect to

    i.   x-axis

                                             [1 mark]

    ii. y-axis

                                             [1 mark]

    iii. the origin

                                             [1 mark]

End of Paper